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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/674,853	09/29/2003	Katayun Barmak	YOR920030338US1	6319
29683	7590	09/28/2005		
HARRINGTON & SMITH, LLP 4 RESEARCH DRIVE SHELTON, CT 06484-6212			EXAMINER GRAYBILL, DAVID E	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 09/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary

Application No.

10/674,853

Applicant(s)

BARMAN ET AL.

Examiner

David E. Graybill

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 19-43 is/are pending in the application.
- 4a) Of the above claim(s) 30-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 19-29 and 38-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1 page</u> . | 6) <input type="checkbox"/> Other: _____ |

Claims 30-37 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 7-14-5.

Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 28-42 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

There is insufficient antecedent basis for the following language:

Claim 38, "the surface adhesion," "each interface," "the bulk," and, "the individual film layers";

Claims 38 and 41, "the barrier";

Claims 39 and 40, "the films thickness";

Claim 41, "the interface," and, "the lattice formation."

In the rejections infra, generally, reference labels are recited only for the first recitation of identical claim elements.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 19, 20, 26, 28, 29 and 38-43 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Hegde (6136682).

In the title, and at column 2, lines 59-60 and 63-64; column 3, lines 24-44; column 4, lines 42-53; column 4, line 63 to column 5, line 13;

column 5, lines 26-29 and 44-57; and column 8, lines 25-58, Hegde discloses the following:

A diffusion barrier comprising a plurality of stacked sub-layers 12/14, each sub-layer having a thickness predetermined to inhibit the formation of a crystalline lattice, to inhibit diffusion of a chemical species through the diffusion barrier; wherein the sub-layers are comprised of alternating layers of at least two different materials; where one of the materials is a metal nitride "TiN"; wherein the at least two materials selected to comprise the sub-layers are substantially immiscible; wherein the at least two materials selected to comprise the sub-layers exhibit mutual adhesion.

A multilayer diffusion barrier comprised of atomically thin (less than roughly equal to 400 angstroms or less because "the thickness of the entire composite layer is roughly equal to 400 angstroms or less") films in which the surface adhesion of each interface inhibits the formation of a lattice in the bulk of the individual film layers, inhibiting diffusion across the barrier; where the films thickness is in a range of about two atoms to about five atoms ""the thickness of the entire composite layer is roughly equal to 400 angstroms or less"; where the films thickness is in a range of about 0.4 nanometers to about 1.5 nanometers "the thickness of the entire composite layer is roughly equal to 400 angstroms or less".

A multilayer structure comprised of three or more sub-layers, wherein the interface of each of the sub-layers dominates the lattice formation on the sub-layers, preventing the formation of a lattice and grain boundaries, to inhibit diffusion of a chemical species through the barrier; where each of the sub-layers is comprised of a metal.

A multilayer diffusion barrier for inhibiting diffusion of chemical species there through, comprising a plurality of stacked layers comprised of alternating films of at least two different metals, the thickness of each of said films being predetermined inherently to substantially eliminate work hardening.

To further clarify the disclosure of three or more sub-layers, Hegde discloses "a composite or amorphous barrier layer," "a composite barrier layer," "a barrier layer," "an amorphous barrier material," and, "a tantalum silicon nitride material but can be any other amorphous barrier material," and it is well settled that the term "a" or "an" ordinarily means "one or more." *Tate Access Floors, Inc., and Tate Access Floors Leasing, Inc., v. Interface Architectural Resources, Inc.*, 279 F.3d 1357; 2002 U.S. App. LEXIS 1924; 61 U.S.P.Q.2D (BNA) 1647 ((citing *Tate Access Floors, Inc. v. Maxcess Techs., Inc.*, 222 F.3d 958, 966 n.4, 55 U.S.P.Q.2D (BNA) 1513, 1518 [**32] (citing *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 977, 52 U.S.P.Q.2D (BNA) 1109, 1112 (Fed. Cir. 1999))).

Claims 38-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hegde (6136682).

Hegde does not appear to verbatim disclose the claimed layer thickness limitations, "atomically thin," "a range of about two atoms to about five atoms," and, "a range of about 0.4 nanometers to about 1.5 nanometers."

Nonetheless, as cited, Hegde discloses that layer thickness is a result effective variable. Therefore, as can be reasoned from well established legal precedent, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that, in view of the applied prior art, the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338,

220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Claims 21 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hegde as applied to claims 20, and further in combination with Li (20030227068).

Hegde does not appear to explicitly disclose where one of the materials is scandium (Sc); where one of the materials is yttrium (Y); where one of the materials is lanthanum (La); where one of the materials is tantalum (Ta).

Nevertheless, as cited, Hegde discloses that the diffusion barrier is "any amorphous barrier layer." In addition, at paragraphs 10, 36, 37, 46, 59-63 and claims 65 and 178, Li discloses an amorphous diffusion barrier layer where one of the materials is scandium, yttrium, lanthanum and tantalum. Moreover, it would have been obvious to combine this disclosure of Li with the disclosure of Hegde because it would provide the "any amorphous barrier layer" of Hegde, and at a low cost.

To further clarify the disclosure of an amorphous barrier, as cited, Li explicitly discloses that the diffusion barrier where one of the materials is yttrium and tantalum is "amorphous." Further, as cited, Li discloses, "the barrier layer material can have a grain size of less than 1 nanometer." Therefore, Li discloses that the diffusion barrier grain size is zero

nanometers, and the diffusion barrier having a zero nanometer grain size is inherently amorphous. In any case, it is not necessary to rely on the disclosure of Li that the diffusion barrier is amorphous to properly combine Hegde and Li.

Claims 19, 20 and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen (20040026119).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

At paragraphs 25 and 26, Chen discloses a diffusion barrier comprising a plurality of stacked sub-layers 6, each sub-layer having a thickness predetermined to inhibit the formation of a crystalline lattice, to inhibit diffusion of a chemical species through the diffusion barrier; wherein the sub-layers are comprised of alternating layers of at least two different materials (Zr and Cu); where one of the materials is copper (Cu) "ZrCuAl."

To further clarify the disclosure of alternating layers of at least two different materials (Zr and Cu), as cited, Chen discloses "a barrier layer

comprising an amorphous metallic glass," and it is well settled that the term "a" or "an" ordinarily means "one or more." Tate Access Floors, Inc., and Tate Access Floors Leasing, Inc., v. Interface Architectural Resources, Inc., 279 F.3d 1357; 2002 U.S. App. LEXIS 1924; 61 U.S.P.Q.2D (BNA) 1647 ((citing Tate Access Floors, Inc. v. Maxcess Techs., Inc, 222 F.3d 958, 966 n.4, 55 U.S.P.Q.2D (BNA) 1513, 1518 [**32] (citing Elkay Mfg. Co. v. Ebco Mfg. Co., 192 F.3d 973, 977, 52 U.S.P.Q.2D (BNA) 1109, 1112 (Fed. Cir. 1999))). Indeed, Chen discloses, "one or more layers of tantalum-aluminum." Therefore, Chen discloses a barrier layer comprising alternating layers comprising an amorphous metallic glass. Furthermore, Chen discloses that the barrier layer is ZrCuAl. Hence, Chen discloses alternating layers of ZrCuAl. As a result, Chen discloses alternating layers of at least two different materials Zr and Cu.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hegde as applied to claim 20, and further in combination with Igarashi (6828189).

Hegde does not appear to explicitly disclose where one of the materials is an oxide.

Notwithstanding, as cited, Hegde discloses that the diffusion barrier is "any amorphous barrier layer." In addition, at column 4, lines 18-25; column 5, lines 5-9; and column 6, lines 15-24 and 56-59, Igarashi discloses

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an amorphous diffusion barrier layer where one of the materials is an oxide "tantalum oxide." Moreover, it would have been obvious to combine this disclosure of Igarashi with the disclosure of Hegde because it would provide the "any amorphous barrier layer" of Hegde.

For information on the status of this application applicant should check PAIR:

Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alternatively, applicant may contact the File Information Unit at (703) 308-2733. Telephone status inquiries should not be directed to the examiner. See MPEP 1730VIC, MPEP 203.08 and MPEP 102.

Any other telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (571) 272-1930. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.
The fax phone number for group 2800 is (571) 273-8300.



David E. Graybill
Primary Examiner
Art Unit 2822

D.G.
22-Sep-05